Waterwheels

Why did the miller need a steady flow of water to operate his mill? The answer to this question is that he needed power. The settlers had no electricity to make their mills work. Instead, they used the waterwheel to turn the energy of water into the power needed to grind grain. The waterwheel was a huge wheel with paddles or buckets around its outside rim.

The undershot wheel

Several types of waterwheels were used. Undershot wheels were powered by swift-running streams or waterfalls. The speed of the water flowing underneath the wheel pushed the paddles and turned the wheel backwards.

The overshot wheel

The most efficient wheel was the overshot wheel. Its source of water was the millpond. From the millpond, water was carried to the mill through a channel known as a millrace and was directed to the top of the wheel through an open trough called a sluiceway. When the sluicegate was opened, the water spilled into the wooden buckets on the outside of the wheel. Even a small amount of water could operate an overshot wheel because the water in the top buckets was pulled down by gravity and forced the wheel to turn. As each bucket reached the bottom, it emptied and went to the top, where it was filled with water again.
The gears

The waterwheel was a powerful piece of machinery. When it turned, the whole mill would shake and groan. The energy created by the wheel was used to grind the grain. But how was this energy passed on from the wheel to the millstones? The answer is gears.

Transferring energy

Two wheels with teeth made up the gears in an old gristmill. These teeth meshed with each other the way the teeth in a zipper do. As one wheel turned, it automatically turned the other. Gears transferred power from the source of energy, the waterwheel, to where the energy was being used, the millstones.

Pumped-up power

The gearwheel that was attached to the waterwheel was large, whereas the gearwheel that turned the millstone was one-fourth the size. Every time the large gearwheel turned once, the small one, which was connected to the millstone, spun four times. The millstone also spun four times, thereby grinding the grain more quickly.

Avoiding sparks

The movement of the gears involved many parts rubbing together, so there was always the danger that friction would produce sparks and start a fire. To avoid a disaster, the miller smeared animal fat on all the moving parts of the gears. The fat was melted by the heat created as the parts rubbed together. The liquid fat kept the gears turning smoothly.
The energy to grind grain came from the vertical waterwheel. The powerful waterwheel turned a vertical gearwheel. This gearwheel meshed with a horizontal gearwheel, which spun the top millstone also in a horizontal direction.
The millstones were covered by a wooden structure called a hoop. It kept the flour from flying all over the room. The flour was pushed out from between the stones and poured into a bin through a hole in the hoop. Then it was put into burlap sacks.

Grain was ground and crushed between a pair of huge, flat, round stones called millstones. They worked just like the stones in a quern. The millstones of the early mills were made at the mill site. In later times, these huge wheels were brought from other places. Because they were so heavy, they arrived in sections and had to be put together at the mill.

The two stones that worked together were known as a run. The bottom stone, or bedstone, did not move. A stonespindle passed through the hole in its center, was attached to the stone on top, called the runner, and made it turn.
The right distance apart

The distance between the two stones was set according to the type of grain being ground. For example, wheat needed less space than corn for grinding. The miller had to make sure that the stones never touched. If they did, the flour would spoil and, what was worse, there was danger of an explosion because the flour could catch fire.

Grain was poured into a large bin on the third floor. It fell down a wooden chute and through the damsel into a large funnel called the hopper. The hopper funneled the grain through a hole, called the eye, in the center of the runner. This top millstone turned about fifteen times a minute.
The miller knew by the feel of the flour between his thumb and fingers if his machinery was running properly. This skill came to be known as the “rule of thumb.”

All sorts of patterns were carved into millstones. The grooves, called furrows, pushed the flour out to the edges of the stones.

Stone furrows
The surface of each millstone had flat areas called land and a special design of grooves carved into it called furrows. In farming, furrows are the grooves made in the land by a plow. Both the land and the furrows ground the grain, but the furrows did three other things. They ripped off the grain’s outer husk, directed the ground flour to the outside of the wheel, and allowed air to pass through the stones to let out the heat created during grinding.
Dressing the millstones

Every few weeks the millstones needed to be "roughed up" or dressed. Both the land and the furrows wore down from constant use. The land had to be made bumpy again, and the furrows cut deeper. The miller or a special artisan called a dresser hammered at the stone with an iron pick called a mill bill. Some of the tiny bits of stone that flew up were driven deep into the skin of his hands.

The miller at this early mill dresses the millstones himself. In other villages, a dresser did this job. A dresser was sometimes asked to "show his mettle," or the small pieces of stone that were buried under his skin. This evidence proved to the miller that the dresser had a lot of experience. This expression is still used today. It means "to show one's worth."